1. Description

We demonstrate a new technique for general purpose interactive segmentation of N-dimensional images. The method creates two segments: “object” and “background”. The technical details can be found in our paper [1] in this proceedings. Below we concentrate on the actual interface.

The user can enter seeds via mouse-operated brush of red (for object) or blue (for background) color. The size of the brush can be changed depending on the size of the object. The user should paint some pixels in the object of interest and some in the background. The seeds provide some clues on what the user intends to segment. As soon as initial seeds are entered, the whole image/volume can be segmented automatically. Basically, the algorithm tries to “predict” how the user would want to paint the rest of the image. Segmentation results are presented by highlighting the object and background segments with red and blue colors. Thus, the object segment appears reddish while the background appears bluish. This gives an intuitive feeling that the algorithm completes the painting started by the user.

An optimal segmentation can be very efficiently recomputed when the user adds or removes any seeds. This allows the user to correct any result imperfections quickly via very intuitive interactions. If the algorithm makes a mistake, the user can add a stroke of red paint in the bluish segment (or blue paint in the reddish segment). The new segmentation would very quickly repaint the whole image to comply with additional hints from the user.

Our method is not sensitive to exact positioning of seeds. Normally, the results would not change in the seeds are moved within the same object in the image or volume. Our method applies to N-D images (volumes). In case of 3D data the seeds are entered in selected representative slices. The information is automatically propagated between the slices because we compute our optimal segmentation directly in the volume. Thus, the whole volume can be segmented based on seeds in a single slice.

2. Examples

(a) Original B&W photo (b) Seeds and segmentation

(c) Kidney segmentation in a 3D MRA data set. Three iterations of binary segmentation gave 4-color labeling.

References